

--16. (new) Ophthalmic lens device according to claim 3, wherein said ophthalmic lens device is a contact lens.

--17. (new) Ophthalmic lens device according to claim 3, wherein said ophthalmic lens device is an intraocular lens.

All would
--18. (new) Ophthalmic lens device according to claim 3 wherein said material has portions whose orientation is responsive to force exerted by ocular tissue.--

REMARKS

The necessary Abstract of the Disclosure is submitted herewith.

The specification has been amended as needed, so as to place this application in condition for disposal at the time of the next Official Action.

The claims previously in the case have been replaced by a set of new claims, that are believed to be proper as to form and clearly patentable over the cited references.

When drafting the new claims, careful attention was paid to the Examiner's formal criticisms of the previous claims, all of which formal criticisms are believed to be satisfied by the new claims.

Reconsideration is accordingly respectfully requested, for the rejections of the claims as being anticipated by SMITH or HUTCHINGS et al. or SCHACHAR or GERDT.

SMITH discloses an accommodating intraocular lens comprising two plastic lens members connected to each other adjacent their peripheral edges so as to provide a cavity therebetween.

When this intraocular lens is deformed, its index of refraction is said to change. This intraocular lens is made of conventional plastic polymers (see column 5, lines 21-31).

The present ophthalmic lens device differs from the intraocular lens of SMITH by the fact that it comprises a material whose refractive index varies in response to a force.

In fact, although SMITH refers to a change of refractive index, it is rather the curvature of the lens, which is modified when the lens is deformed. One skilled in the art indeed knows that a mere deformation of a lens cannot lead per se to varying its refractive index.

Thus, SMITH teaches that the intraocular lens is made of conventional plastic polymers. These polymers cannot have their refractive index varied in response to a mechanical effect.

As SMITH fails to teach an ophthalmic lens device comprising a material whose refractive index varies in response to a force, the claimed invention is novel over this reference.

HUTCHINGS relates to a laser accelerometer comprising a sensor formed of a birefringent material that is isotropic.

HUTCHINGS does not disclose an ophthalmic optical lens, and still less an ophthalmic optical lens comprising a material whose refractive index varies in response to a force.

Therefore, the claimed invention is novel over this reference.

The earlier SCHACHAR patent refers to an intraocular lens including a fluid expendable sac for containing a fluid.

According to one particular embodiment, the fluid can be a liquid crystal material used in combination with an electrode and microprocessor for changing the index of refraction of the posterior chamber intraocular lens.

The present ophthalmic optical lens differs from SCHACHAR by the fact that the index of refraction varies in response to a force exerted by an ocular tissue such as the zonulae or the eyelids. The present invention does not require the provision of any electromechanical device, as taught by SCHACHAR.

The claimed invention is therefore novel over the teaching of SCHACHAR.

GERDT relates to an optic coupler including a plurality of optical fibers encapsulated in a photorefractive encapsulating material.

Said material has an index of refraction that is modulated by applying illumination thereto.

GERDT does not disclose an ophthalmic optical lens, and still less such a lens comprising a material the refractive index of which can vary under a force exerted by an ocular tissue.

Therefore the claimed invention is novel over GERDT.

The later SCHACHAR patent was regarded as making claim 1 obvious.

This reference relates to an elastically deformable lens wherein the optical power of the lens can be varied by small changes of its equatorial diameter.

The cited paragraph on column 2, lines 18-25, relates to the prior art of this patent.

According to this passage, it was known to produce lenses formed from a liquid crystal and to produce a variable power in the lens by varying electric current across the liquid crystal. It was also known to produce lenses with other crystals, whose index of refraction can be continuously varied by electrical or mechanical means. It is noted that it is not clear whether the word "crystals" relates to a liquid crystal or any other type of crystals.

In any event, this short passage does not teach or suggest to one skilled in the art that an ophthalmic optical lens can be made from a material such as a liquid crystal, having its index of refraction varying in response to a force exerted by an ocular tissue.

As the claims now in the case bring out these distinctions with ample particularity, it is believed that they are all patentable, and reconsideration and allowance are respectfully requested.

Attached hereto is a marked-up version showing the changes made to the specification. The attached page is captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE."

Respectfully submitted,

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ABSTRACT OF THE DISCLOSURE

AI
Intraocular lenses, for example intraocular implants, contact lenses and the like. The optical system is made of a material whereof the refractive index varies along at least one given direction, this material being a homogeneous material with variable index according to its chemical composition or by the action of mechanical effects, or a heterogeneous material with different molecular orientations. The invention is useful for making lenses with accommodative sighting.

"VERSION WITH MARKINGS TO SHOW CHANGES MADE"

IN THE SPECIFICATION:

Page 4, the paragraph, beginning on line 4, has been amended as follows:

--By way of example, mention will be made of the case of silicones substituted with 9-vinylnanthracene [moieties] substituents. The refractive index of the material obtained increases as the content of substituents increases:

- without substituent: $n = 1.403$
- with 94% substituents: $n = 1.690$ --.

Page 5, the paragraph, beginning on line 7, has been amended as follows:

--Next, the degree of substitution is modified continuously, and thus also the refractive index of the material, in order to obtain copolymers with a [moduleable] modulatable proportion of substituted units and of unsubstituted units. In the case of silicones, it is necessary to prepare the copoly(methylhydrogenodimethyl)siloxane of variable composition beforehand.--.

Page 10, the paragraph, beginning on line 15, has been amended as follows:

--According to one characteristic of the invention, the material of which the optical system is made is a three-dimensional liquid crystal polymer whose mesomorphic [moieties]

portions can be readily oriented by means of a mechanical effect.--;

the paragraph, beginning on line 20, has been amended as follows:

--It is possible, for example, firstly to prepare crosslinked liquid crystal polymers without prior orientation of the mesogenic units. Using this material, artificial crystalline lenses or intraocular lenses will then be produced, for example by polymerization/crosslinking in a mold or by machining depending on the properties of the material. The zonulae exert a mechanical stress which is reflected, via the lens sac, onto the crystalline lens. This stress exerted by ocular tissue modifies the orientation of the liquid crystal substituents and thus the refractive index in the direction of vision. Similarly, in the case of contact lenses, a pressure from the eyelids can produce mechanical deformations needed for the molecular reorientation and thus vary the refractive index and consequently the power of the lens.--.